

**PROPOSED MODIFICATIONS OF CAMERA
CALIBRATOR BASED ON EXPERIENCE
GAINED FROM EVALUATION OF
NAVY PROTOTYPE**

1. Neutral Density Filters and Zone Rheostats

Problem:

The loss in illumination owing to the $\cos^4 \theta$ law becomes appreciable for the marginal area of cameras having large angles of view. The loss of light by vignetting is in addition to that resulting from the $\cos^4 \theta$ law. The loss in illumination varies for cameras of different manufacture.

Solution:

It is recommended, therefore, that the bulk of the light loss owing to the $\cos^4 \theta$ law be balanced by the insertion of neutral density filters and any additional loss beyond the $\cos^4 \theta$ law be balanced by varying the lamp illumination through individual rheostats for each zone of collimators. Neutral density filters are supplied in 0.1 density unit steps and shall be selected to compensate approximately the $\cos^4 \theta$ law. The reason for balancing the $\cos^4 \theta$ law with neutral density filters is that the bulk of the correction is accomplished without a change in color temperature and only a relatively small change in color temperature results by use of a rheostat for a relatively slight change in illumination. The majority of cameras to be calibrated will not be supplied with anti-vignetting filters. However, when a camera to be calibrated is received with an anti-vignetting filter, the neutral density filters can be removed and the illumination balance achieved by rheostat adjustment. It is to be emphasized that the function of balancing illumination is a problem owing to the variation in the cameras to be calibrated and not the camera calibrator.

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Neutral density filters shall be installed as follows:

<u>Zone</u>	<u>Density</u>
0°	0.6
7.5°	0.6
15°	0.6
22.5°	0.6
30°	0.3
37.5°	0.3
45°	None

The installation of 7 rheostats fulfills the requirement of individual zone adjustment.

2. Trimming Rheostats

Problem:

Owing to the difference in the intensity of illumination between individual lamps, the procedure in the past has been to select lamps of equal illumination. A problem arises, however, when a lamp burns out. It is rather difficult to insert a new lamp that is equal in intensity to the remaining lamps that have been used for some time. The usual procedure is to replace all lamps when one lamp burns out. This procedure is costly, time consuming, and requires a large stock of balanced lamps.

Solution:

Install an easily accessible panel containing 25 trimming rheostats as a means of adjusting the illumination intensity for over-all uniformity of each zone.

3. Rectification of resolution targets.

Problem:

Inasmuch as the reticle planes of all collimators, other than the central collimator, are not parallel to the focal plane of the camera, the width of the radial and tangential lines on the reticle are enlarged by a factor of $\cos \theta$ and $\cos^2 \theta$, respectively, on the calibration exposure. The current procedure to correct for this effect, is to utilize specially prepared tables for each zone.

Solution:

Prepare art work for each zone with the $\cos \theta$ and $\cos^2 \theta$ effect compensated. Prepare reticles from six different art work layouts. Since the cosines of 0° and 7.5° differ by less than 1 percent, the reticles of the 0° and 7.5° zone shall be identical. Number the resolution targets consecutively for easy identification of the 25 collimators.

4. Elimination of Electrical Console

Problem:

The electrical console presents no significant problem other than an accessory piece of equipment connected to the camera calibrator by means of a electrical cable. The basic reason for this design, was to isolate vibration.

Solution:

Redesign horizontal cross-section of camera calibrator from four semi-circular recessed areas to one semi-circular recessed area and three straight sides. This configuration results in greater "desk top" area and greater internal space to accommodate electrical system and other storage. Constant voltage regulator shall be mounted directly on the floor inside the camera calibrator housing but totally isolated from the camera calibrator to preclude the transmission of vibrations.

5. Data Card Recording

Problem:

Lack of exposure number, make of camera, serial number, date, operator, etc., on the calibration exposure as a permanent and integrated record.

Solution:

Installation of a data card projector for the recording of pertinent data on the calibration exposure.

6. Other Modifications

- a. One optical reflecting surface in lieu of two. Less light loss and easier adjustment procedure.
- b. Place center-annulus on resolution target; thereby eliminating the annulus optical element.
- c. Simplified x, y, z adjustment of collimator.
- d. Simplification of camera holders.

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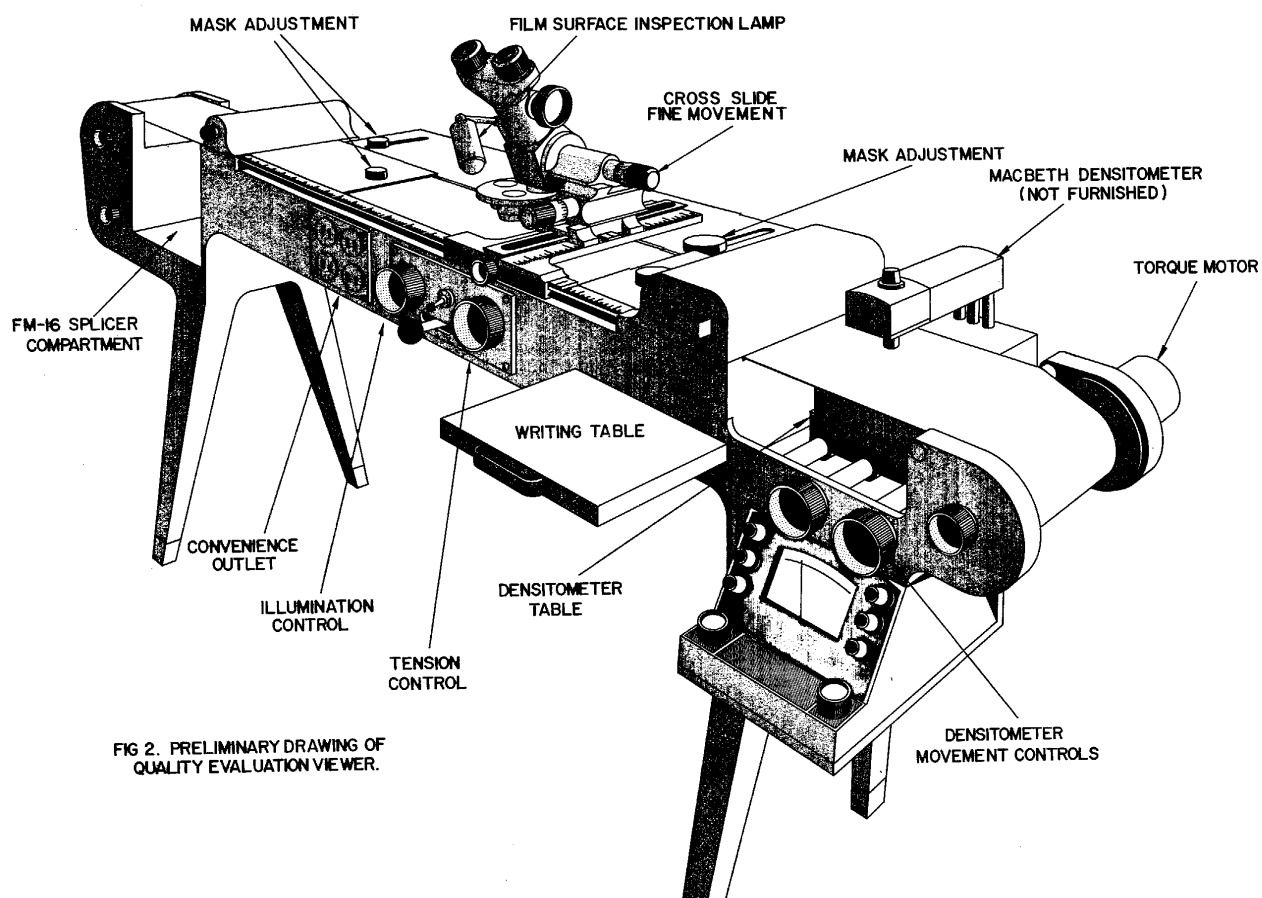
1 September 1959

Chris -

Items 1, 2 & 3 result in additional
cost of [REDACTED] Contract being amended.

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Next 1 Page(s) In Document Exempt

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